What drives the spreading pattern of the Mediterranean Outflow Water (MOW) in the eastern Gulf Of Cadiz, SW Iberian Peninsula?

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Abstract

The inverse estuarine circulation through the strait of Gibraltar is responsible for the overflow of dense, saline MOW towards the Atlantic basin. The classical views divide MOW dynamics in an initial descent phase along the first 100 km as an entraining gravity undercurrent followed by a damped geostrophic flow phase. West of 8ºW it is seen as a multi-layered, buoyant plume parked at depths ranging 800-1300 m. Recent MB bathymetry has revealed a complex seafloor morphology that questions this classical view. Sinuous submarine channels and sharp depth falls are expected to play a relevant role in the definition of the NACW-MOW interface and the MOW spreading pattern. In this work we analyze more than 4500 QCd CTD and 950 LADCP observations taken in the eastern Gulf of Cádiz to study of the small-scale features of the MOW spreading pattern as well as the secondary circulation associated with sharp current bends. Data show that small-scale depth falls, abrupt channel turns and current-submarine mount interaction may bring the MOW to high Rossby number situations. Most of these may also drive the flow to subcritical and enhance large amounts of mixing past the initial plunging phase, which seems non negligible as compared with tidal stirring, shear instability and double diffusion along the MOW pathway.